

Table below represents a complete list of all 20 CALFED draft alternatives. The "CALFED Bay Delta Program Draft Alternatives" report describes different aspects of each one of these draft alternatives in details.

Alt #	Title
1	Reduce Export with New Supplies
2	Transfer Supplies for the Drought Water Bank
3	Yolo Bypass Conveyance Facility
4	Habitat Restoration
5	Habitat Restoration with Dedicated Environmental Water
6	Extensive Habitat Restoration with New Storage
7	Water Management with Environmental Storage
8	Chain of Lakes Isolated Facility
9	Additional Export Capacity with South of Delta Storage
10	Delta Island Protection and Small Isolated Facility
11	Improved Through-Delta Conveyance with Screened Diversion at Hood
12	Dual Transfer Facility
13	East-Side Foothill Large Conveyance Facility
14	West-Side Sacramento Small Transfer Facility
15	West-Side Sacramento Storage and Conveyance Facility
16	East-Side Delta Isolated Facility
17	Protection of Delta Islands and Functions
18	Delta Island Protection with Storage
19	Pollutant Source Controls and Operational Changes
20	Source Control and Added Storage

The following is the summary of the CALFED alternatives 11 Through 20 based on my "CALFED Bay Delta Program Draft Alternatives" personal review.

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**Alternative 11 : Improved Through-Delta Conveyance with  
Screened Diversion at Hood**

This alternative is intended to provide a more reliable and higher-quality water supply from the Delta by increasing through-Delta conveyance, substantially greater protection of fish from entrainment effects, and improved aquatic habitat productivity in the Delta.

***Benefits***

**Ecosystem Quality :** Reduction of the fish loss from the Sacramento River across the Delta to the South Delta pumping plants, habitat restoration actions in the Delta, additional improvements to ecosystem quality due to reducing diversion and reverse flow impacts associated with Delta exports, productivity improvements in the western Delta and lower San Joaquin River, and finally reducing the losses of anadromous and resident fish from the Sacramento River, Suisun Bay and the Delta to exports at the south Delta pumping plants are the benefits to the ecosystem quality of the Delta.

**Water Supply :** The improved through-Delta conveyance would provide a more reliable and higher quality water supply, and the 1995 Water Quality Control Plan objectives would remain in place.

**Water Quality :** Greater isolation of export water from sea water intrusion and more dilution of Delta agricultural drainage would enhance the water quality for areas receiving Delta export water, as well as in-Delta diverters.

**System Reliability :** Western Delta habitat restoration, levee maintenance, and more stable levees in the Mokelumne River system would improve system reliability within the Delta.

## ***Constraints and Concerns***

**Fish :** Large screens on the Sacramento River will be costly and difficult to maintain, and may not be quite effective in minimizing fish entrainment and impingement. Sacramento and Mokelumne rivers salmon and steelhead may also have more complicated and potentially more inhibited pathways than at present with the revised Delta configuration.

**Water Quality :** Beneficial uses would continue to be limited due to the water quality problems in the Delta.

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## **Alternative 12 : Dual Transfer Facility**

This alternative with an isolated diversion facility from the Sacramento River, reduces diversion effects on fish and provides a more reliable water supply from the Delta by providing a screened intake to supply both a new, small isolated transfer facility, and through-Delta conveyance.

## ***Benefits***

**Ecosystem Quality :** The small isolated transfer facility and through-Delta conveyance improvements would reduce diversion impacts on fish, and also reduces the reverse flow impacts currently associated with the export pumps. Western Delta and lower San Joaquin River would have improvements in ecosystem productivity, and the quality of habitat would be increased, specially in the west Delta by complementary restoration actions. Through the creation of wetlands and riparian zones, terrestrial and avian species would also benefit.

**Water Supply :** water supply reliability and flexibility will be substantially improved by actions through increased opportunity for diversion and through facilities less vulnerable to effects of salinity intrusion. Water transfer opportunities will also be improved. Regulatory intervention in water supply operations would be reduced by reducing diversion effects.

**Water Quality :** Some users will have the benefit of using relatively high quality water.

### ***Constraints and Concerns***

**Fisheries :** Due to Sacramento River flows in eastern Delta channels, loss of smolts and disorientation of adult salmon from the Mokelumne and Calaveras Rivers could be expected.

**Water Quality and Supply :** Reductions in Sacramento River inflow could result in degrading the Delta water quality.

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### **Alternative 13 : East-Side Foothill Large Conveyance Facility**

This alternative includes an isolated conveyance facility, located along the east side of the Sacramento and San Joaquin Valleys, connecting intakes on the Sacramento, and Feather Rivers to the California aqueduct in Kern County. This project is to increase the yield and water quality of the export supplies, make them less vulnerable to catastrophic failure, and reduce the need to operate Delta diversions during the winter and spring months.

### ***Benefits***

**Ecosystem Quality :** Since agricultural exports would continue to be diverted from the south Delta, habitat restoration actions would be implemented at moderate levels in this alternative. Ecosystem quality would be improved due to reducing diversion and reverse flow impacts currently associated with Delta exports. Reduction of fish losses at the south Delta pumping plants, productivity improvements in the western Delta and lower San Joaquin River, and providing a moderate habitat restoration in the Delta are other benefits of this alternative.

**Water Supply :** Supply reliability and quality would be improved for the water users. Water users in the San Joaquin Valley could benefit from the conjunctive use program. The 1995 Water Quality Control Plan objectives would also remain in place.

**Water Quality :** Quality of water will be improved for the Sacramento and Feather Rivers users and areas receiving Delta export water. Reduction in pollutant loads in the San Joaquin River and increased San Joaquin River system inflow would be other benefits to the In-Delta water users.

**System Reliability :** Due to more stable levees in the Delta system, an increase in system reliability would be expected. Delta habitat restoration and levee maintenance would also improve system reliability.

### ***Constraints and Concerns***

**Fish Mortality :** Losses of Delta resident, and San Joaquin Delta anadromous fish would still occur at a lower rate.

**Facility Construction Impacts :** Several significant environmental impacts would occur due to the East Valley conveyance facility construction.

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### **Alternative 14 : West-Side Sacramento Small Transfer Facility**

In this alternative, a new diversion at Thermolito Forebay on the Feather River would help reduce export entrainment impacts and increase supplies by shifting the location and timing of a portion of exports.

### ***Benefits***

**Ecosystem Quality :** Restoration and enhancement of riverine, riparian, wetland, and adjacent terrestrial habitat will moderately improve ecosystem quality. Channels and floodway expansion will help restore fish spawning, rearing, and feeding habitats and improve fish survival. Impacts on fisheries would be reduced by moving a major portion of the south Delta diversions to screened locations upstream of the Delta. Improvements to Clifton Court Forebay will also help in reducing the number of fish diverted into the forebay and increasing their survival rate.

**Water Supply :** Development of additional upstream storage and operation of the west-side transfer facility would improve water supply and reliability.

**Water Quality :** Relocation of the diversion upstream of the Delta, reclamation of agricultural, municipal and industrial wastewater, point and non-point source controls and mine drainage, and remediation will help improve water quality in this alternative.

**System reliability :** The risk of interrupting of the operations by a failure of in-Delta facilities will be eliminated by export facilities relocation outside of the Delta. Better levees and protection for adjacent land uses are achieved by creation of shallow water habitats. Improvement of the levees around the critical western islands would help protect in-Delta and agricultural export water supplies from salinity intrusion due to island failure. Levee management and reconstruction will improve the reliability of in-Delta facilities.

### *Constraints and Concerns*

**Fisheries :** Mortality in South Delta export facilities would be decreased, but would not be eliminated. Salmon smolts could be entrained into Tehama Colusa diversion.

**Water Quality :** Possible degrading in south Delta water quality. Reduced instream flows below Thermolito, Tehama Colusa diversion points.

**Land Uses :** Limited measures to resolve subsidence of Delta islands site-specific impacts.

**Costs :** This alternative could cost substantially.

**Vegetation and Wildlife :** The new storage reservoir may have an impact on vegetation and wildlife.

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## **Alternative 15 : West-Side Sacramento Storage and Conveyance Facility**

Construction of new consolidated diversions at Shasta Lake and Lake Oroville with capacities to capture significant wet weather in this alternative, would help in conveyance of water along the west side of the Sacramento Valley to off-stream storage reservoirs, groundwater storage, and to south Delta pumps.

### ***Benefits***

**Ecosystem Quality :** This alternative would improve ecosystem quality by eliminating the impacts of the major diversions and providing more opportunity for managing flows and temperature in the Sacramento River and upstream tributaries. The elimination of the export pumps in the south Delta along with habitat restoration and enhancement in the Delta will improve fish production.

**Water Supply :** Providing additional storage for critical periods for Urban, Agriculture and environmental uses would improve water supply reliability. The reliability will substantially improve since all the major diversions are moved off the Sacramento River and Delta.

**Water Quality :** The diversion of higher quality water in the upstream areas would be a great improvement in the exports water quality. Control of the contaminants and limiting the pollutants at the source before they are released into receiving water, will enhance the water quality.

**System Reliability :** Stabilization actions at moderate levels further improve the reliability of the Delta from catastrophic inundation which protects existing and restored shallow water habitat, land uses, infrastructure, water supply and water quality. An emergency levee management plan to provide necessary funding and direction could be accomplished through expansion and continuation of existing programs such as the Delta Flood protection act of 1988 (SB 34) as well as sufficient funding of these efforts in the future.

## *Constraints and Concerns*

**Ecosystem Quality :** A small portion of the flood flows is diverted in the Sacramento and Feather River systems. Pulse flows needed to stimulate salmon in-and out- migration may be affected. If any of the new large westside reservoir sites contain endangered species it may cause abandonment of the alternative. Bay habitat restoration could result in loss of terrestrial habitat.

**Water supply :** A large evaporation losses during the summer months could occur by the storage of water in the westside reservoirs.

**Cost :** This alternative may have to be implemented in stages since it is a high cost project.

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## **Alternative 16 : East-Side Delta Isolated Facility**

This alternative constructs a canal around eastern and south-eastern edges of the Delta to serve multiple users such as SWP, CVP, EBMUD, and San Joaquin County users. While reducing diversion effects on fish, this alternative improves export water quality, supply, and reliability.

## *Benefits*

**Ecosystem Quality :** Relocation of the export diversion from the current south delta location to the Sacramento River and habitat restoration at high levels would improve ecosystem quality.

**Water Supply :** Due to reduced threatened and endangered species constraints on exports, water supply predictability would be increased. Improved integrated resources management will make alternate supplies available when needed. Finally, supply reliability is substantially improved with this alternative because the threat of interruption due to salinity intrusion as a result of Delta levee failures is diminished.



**Water Quality :** Access to higher quality Sacramento River water, and increased in-stream flows due to transfers between Delta water users will improve the export water quality. Contaminants quantities entering the aquatic system are also reduced in this alternative.

**System Reliability :** Levee maintenance actions will provide additional protection against flood- and seismically-induced levee failures. Local diversions and the water projects possibility of prolonged shutdown will be reduced. The remaining agriculture, recreational, and associated land uses will be allowed to continue by the implementation of subsidence reduction.

### ***Constraints and Concerns***

**Fisheries and Wildlife :** The new diversion may have a possibility of entrainment effects, and flows could be reduced within natural channels below the new diversion.

**Site Specific Impacts :** Environmental/socio-economic impacts associated with construction of new facilities.

**Feasibility :** Enforcement of pollutant source control regulations may be difficult to implement without adequate funding. Environmental, social, equity impacts of raising or building additional reservoirs, and other facilities.

**Water Quality :** Potential water degradation in the south Delta.

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### **Alternative 17 : Protection of Delta Islands and Functions**

Levee and channel improvements, habitat restoration, and flow barriers are the actions of this alternative to achieve system vulnerability, improvements in Delta aquatic and terrestrial habitat, and equitable water supply flexibility.

## ***Benefits***

**Ecosystem Quality :** A minimal level of habitat restoration would help improve ecosystem quality and protect the existing habitat from catastrophic failure. Land retirement and fallowing in the Delta could provide areas for habitat restoration and improve water quality.

**Water Supply :** Reduction in reliance on the Delta as a source of water supply through demand reductions and development of alternative sources of supply, would improve water supply reliability. Channel improvements, levee maintenance, and stabilization actions will also improve water supply reliability in the Delta.

**Water Quality :** reclamation of agricultural, municipal, industrial wastewater, and land retirement and fallowing could lead to improvements in Delta water quality by reducing the areal extent of agricultural lands contributing nonpoint and point discharges resulting from agricultural use. Core actions such as mine drainage remediation would also enhance water quality.

**System Reliability :** Providing a minimum level of flood protection for all Delta islands would help reduce the vulnerability of Delta functions to catastrophic failure. Flood protection actions could also reduce the vulnerability of islands with infrastructure and valuable existing habitat.

## ***Constraints and Concerns***

**Ecosystem Quality :** No integrated habitat management strategies, upstream habitat improvements, fish hatchery or harvest operations improvements are included. The selection of high priority and highly feasible sites may result in disjointed habitat throughout the Bay-Delta system.

**Water Supply :** Water supply actions do not include on-stream storage expansions or new construction, or the relocation and/or consolidation of diversions.

**Fisheries :** Complete restoration of important fish populations may not be possible without reducing the use of the Delta as a water supply conduit and greatly reducing from the south Delta although improvements to habitat and fish survival will benefit ecosystem quality. South Delta export facility would maintain a high mortality rate.

**Exports :** While export water quality remains problematic, export supplies remain constrained to interruption.

**Transfers :** Water transfer opportunities remain highly constrained since the Delta configuration is unchanged.

**Solution Principles :** Ecosystem and vulnerability improvements without commensurate water supply benefits may violate principles.

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#### Alternative 18 : Delta Island Protection with Storage

Levee and channel improvements, habitat restoration, and flow barriers are the actions of this alternative to achieve system vulnerability, improvements in Delta aquatic and terrestrial habitat, and equitable water supply flexibility. Diversions are relocated to reduce fish impacts, and water is purchased for environmental management.

#### *Benefits*

**Ecosystem Quality :** Habitat restoration and instream flow management above current values would improve ecosystem quality. Increased flood control actions help this alternative integrate the linkage between flood control and beneficial uses of Delta water supplies. This alternative also protects and enhances the habitat elements that have been modified and are currently inadequate. Channel maintenance would improve conveyance of flood flows through the Delta and restores aquatic habitats in combination with waterside berms where current habitat is inadequate. The incorporation of concentrated large amounts of habitat on flooded islands will tend to create independent tracts of valuable habitat.

**Water Supply :** Demand reductions, additional storage facility, and development of alternative sources of supply are the factors to improve the reliability of the Delta as a source of water supply and export water supply reliability in this alternative. Combining conservation, land retirement and fallowing, and wastewater reclamation reduces direct demand by reducing surface water diversions, or in some cases, groundwater pumping. Channel improvements, levee maintenance, and stabilization actions from salinity intrusion by elevated levels of protection of the critical western Delta islands will also improve water supply reliability in the Delta.

**Water Quality :** Core actions such as mine drainage remediation would also enhance water quality. Channel improvements, levee maintenance, and stabilization actions at moderate levels would improve the reliability of Delta water quality. Water quality concerns for beneficial uses are addressed by improving flood protection and seismic resistance of levees on the critical western Delta islands such as Sherman, Jersey, and Bradford.

**System Reliability :** Channel improvements, levee maintenance, and stabilization actions at moderate levels would improve the reliability of the Delta from catastrophic inundation which protects existing and restored shallow water habitat, land uses, infrastructure, recreation, water supply and water quality. Continued protection of Delta functions as an integrated resource system is accomplished by an emergency levee management plan to provide necessary funding and direction to reclaim Delta islands in the event of inundation by expansion and continuation of programs such as the Delta Flood Protection Act of 1988 (SB 34) and sufficient funding in the future.

### ***Constraints and Concerns***

**Fisheries :** Complete restoration of important fish populations may not be possible without reducing the use of the Delta as a water supply conduit and greatly reducing from the south Delta although improvements to habitat and fish survival will benefit ecosystem quality. South Delta export facility would maintain a high mortality rate.

**Exports :** While export water quality remains problematic, export supplies remain constrained to interruption.

**Transfers :** Water transfer opportunities remain highly constrained since the Delta configuration is unchanged.

**Solution Principles :** Moderate ecosystem and vulnerability improvements without commensurate water supply benefits may violate principles.

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#### **Alternative 19 : Pollutant Source Controls and Operational Changes**

This alternative constructs flow and fish barriers at Delta Cross Channel, Georgiana Slough, and Three-Mile Slough, and tide gates or flow barriers in southern Delta. It is to maximize water quality improvements in the Bay-Delta through managing and controlling pollutant sources and implementing operational modifications to upstream storage and diversion systems.

#### ***Benefits***

**Ecosystem Quality :** Habitat restoration and instream flow management above current levels and major reductions in pollutants entering the system, would enhance the ecosystem quality in this alternative.

**Water Supply :** Increasing fish populations, reducing the possibility of regulatory intervention in operations.

**Water Quality :** Controlling and managing contaminant sources, providing increased flows when needed to dilute water quality contaminants and reduce salinity levels, increasing the supply, and reducing the risk of island inundation, all contribute to an improved water quality. Stabilization of levees and channels reduces the risk of a catastrophic event causing degradation in the water quality.

**System Reliability :** Vulnerability of the Delta from catastrophic inundation will be reduced by the island and levee maintenance and stabilization.

## *Constraints and Concerns*

**Water Supply :** Exports will remain highly constrained and vulnerable to interruptions due to ESA take restriction.

**Transfers :** Since Delta configuration remains unchanged and uncertainty due to ESA restrictions, water transfers will be highly constrained.

**Fish :** Mortality rate at diversion facilities remain constructed.

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## **Alternative 20 : Source Control and Added Storage**

This alternative enhances water quality through pollutant source management and provides additional surface water storage. Increasing capacity of selected reservoirs and downstream channel capacities to reduce reservoir flood control capacity requirements, constructing flow and fish barriers in the Delta and tide gates or flow barriers in the southern Delta, are physical and structural features of alternative 20.

## *Benefits*

**Ecosystem Quality :** The overall ecosystem quality is improved by restoring Delta levees, Delta, San Joaquin River, Bay, and channel island habitat. An overall increase in potential to manage upstream reservoir storage/outflow, upstream and in-Delta habitat, and diversions to enhance ecosystem quality is achieved by the management actions in this alternative. Entrainment impacts would also be reduced.

**Water Supply :** Development of additional storage would result in increased water supply and reliability. Operational flexibility is improved through environmental water purchases and re-operation of existing upstream reservoirs.

**Water Quality :** Combined pollutant source management and in-Delta flow management could benefit water quality significantly. Degradation of water quality caused by a catastrophic event can be reduced through stabilization of levees.

**System Reliability :** Implementation of levee improvement measures could above the core-level would lead to a reliable system.

***Constraints and Concerns***

**Pollutant Source Control Enforcement :** Implementation of enforcing the pollutant source control regulations may be difficult.

**Effects of Bioaccumulation :** Storing pollutant flows in the wetlands could increase wildlife contaminant concentrations through bioaccumulation.

**Export Pumping Restriction :** Water supply benefits depend on the improvement of fish production to reduce the effect of ESA restrictions.

**Fish mortality :** South Delta export facilities maintains a high fish mortality rate.

**System Vulnerability :** Flooding and catastrophic failure could still threaten some Delta islands.

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